

Code No: **R42034**

R10

Set No.1

IV B.Tech II Semester Regular Examinations, April/May - 2014

AUTOMATION IN MANUFACTURING

(Mechanical Engineering)

Time : 3 hours

Max. Marks: 75

Answer any Five Questions
All Questions carry equal marks

1. a) Draw the general structure of a hydraulic circuit and explain the important components involved in it. [7]
b) Describe the function and working of the single station automated machine tool. [4]
c) Explain the following automation strategies:
(i) Plant Operation Control (ii) Process Control and Optimization. [4]
2. a) Draw the neat sketches of the Ratchet and Pawl mechanism and discuss briefly. [6]
b) Explain briefly Chain Drive Conveyor System. [5]
c) What are the different types of control function that are required in an automated flow line? [4]
3. a) The following data apply to a 10-station in-line transfer machine:
 $P = 0.015$ (all stations have an equal probability of failure)
 $T_c = 0.4$ min
 $T_d = 4.0$ min
Using the lower-bound approach, compute the following for the transfer machine: (i) the frequency of line stops, (ii) the average production rate (iii) the line efficiency. [7]
b) Discuss the efficiency of automated flow lines with storage buffer. [4]
c) What is 'Upper-bound approach' used in the analysis of transfer lines? [4]
4. a) What is precedence diagram in the line balancing and explain briefly. [5]
b) Explain the importance in solving line balancing problems by using Ranked Positional Weights Method. [6]
c) What are the different manual methods for solving the line balancing problems? Briefly discuss any one method. [4]

5. a) What are the important categories of Automated Guided Vehicle Systems?
Discuss them briefly with the help of neat sketches. [7]
b) Discuss the important factors to be considered in material handling system design. [4]
c) Explain the applications of Automated Guided Vehicles. [4]
6. a) Define 'work-in-process'. [3]
b) Briefly describe the Pickup and deposit stations of an AS/RS: [6]
c) Describe the Aisle transfer cars of an AS/RS system. [6]
7. a) What are the various operation parameters that can be measured in milling operation to use them in adaptive control systems? [6]
b) Draw the block diagram of Adaptive Control with Optimization system for drilling process. [5]
c) What are the advantages of using adaptive control systems in turning operation? [4]
8. a) Explain the different types of CMM controls. [6]
b) Name the different types of contact inspection techniques and explain any one technique. [5]
c) What are the applications of machine vision system? [4]

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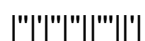
1. a) What are the important pneumatic components used in automated system? [5]
b) Explain the following automation strategies:
(i) Combined Operations (ii) On-line inspection [5]
c) Describe the function and working of the following automated machine tools:
(i) Transfer Machine (ii) Single Station Machine. [5]
2. a) Illustrate the working of walking beam transfer system with the help of neat sketches. [7]
b) Discuss the advantages and limitations of using buffer storage capacity zones in automated flow lines. [4]
c) Draw the neat sketches of the Over and Under type chain drive mechanism. [4]
3. a) What are the various basic approaches used in the analysis of transfer lines without storage? [4]
b) Discuss the efficiency of automated flow lines with storage buffer. [4]
c) In a 15 station transfer line, the probability that a station break down will occur for a given work part is equal to 0.015. This probability is the same for all 15 stations. Determine the frequency of line stops per cycle on this flow line using the upper bound approach and also calculate the production rate. [7]
4. a) What is ranked positional weight value? [4]
b) Discuss the Inventory Buffers between stations for improving the performance of the line balance. [5]
c) What are the various possible ways that should be considered by the designer for improving the operation of the line? [6]
5. a) Discuss the important factors to be considered in material handling system design. [5]
b) Discuss the important features of conveyors and their applications. [5]
c) Discuss the safety issues for the AGVS to operate efficiently. [5]

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6. a) What are the advantages of Automated Storage Systems? [5]
b) Explain the Storage/Retrieval mechanism of an AS/RS. [5]
c) Discuss the use of automated work-in-process storage systems. [5]
7. a) Name the different types of adaptive control systems and distinguish between them. [4]
b) List out the various operation parameters that can be measured in turning operation to use in adaptive control systems. [6]
c) Draw the block diagram of a typical computerized Adaptive Control with Constraints system for grinding process. [5]
8. a) List out the different applications of CMM. [6]
b) Define accuracy, precision and sensitivity of an automated inspection system. [3]
c) Explain the image processing and analysis in the operation of machine vision. [6]



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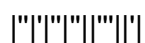
- 1.a) What are the important mechanical feeding devices used in automated systems? [4]
b) What are the important pneumatic components used in automated system? [4]
c) Describe the function and working of the transfer machine type of automated machine tool. [7]
- 2.a) What are the important considerations that are to be taken into during design and fabrication of automated flow lines? [5]
b) Draw the neat sketches of the Ratchet and Pawl mechanism and discuss briefly. [5]
c) Explain the use of buffer storage zones in automated flow lines. [5]
- 3.a) What is 'Lower-bound approach' used in the analysis of transfer lines? [4]
b) What is the Partial Automation used in automated flow lines? [4]
c) An eight-station rotary indexing machine operates with an ideal cycle time of 45 s. The frequency of line stop occurrences is 0.08 stops/cycle on the average. When a stop occurs, it takes an average of 3 min to make repairs. Determine the following:
(i) Average production time
(ii) Average production rate
(iii) Line efficiency
(iv) Proportion of downtime [7]
- 4.a) Explain how the methods analysis will improve the line balance. [5]
b) Discuss the Dividing work elements for improving the performance of the line balance. [6]
c) Enumerate the differences between flexible assembly lines and manual assembly lines. [4]
- 5.a) What are the various material handling equipments used in manufacturing industries? [4]
b) Describe the unit load carrier AGV with the help of simple sketch. [7]
c) List out the traffic control issues for the AGVS to operate efficiently. [4]

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- 6.a) Discuss how to overcome the problems that are encountered in interfacing AS/RS units to the manufacturing function. [5]
- b) Describe the load identification station feature of an AS/RS. [5]
- c) Explain the Storage modules of an AS/RS. [5]
- 7.a) What are the applications of adaptive control system in various machining operations? [4]
- b) List out the variable parameters that can be measured in grinding process to use in adaptive control system. [6]
- c) Draw the block diagram of a typical computerized Adaptive Control with Constraints system for milling process. [5]
- 8.a) What are the various advantages of using CMM? [5]
- b) Write the step by step inspection procedure to be performed. [5]
- c) What is image acquisition and digitization in the operation of machine vision? [5]



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- 1.a) Describe the function and working of the following automated machine tools:
(i) Transfer Machine (ii) Single Station Machine. [6]
b) Describe the function and working of the rotary indexing automated machine tool. [5]
c) Draw the simple block diagram of pneumatic circuit and label the parts. [4]
- 2.a) Explain the reasons for the use of buffer storage zones in automated flow lines. [4]
b) Discuss the common reasons for line stoppages in automated flow lines [4]
c) Explain briefly cam mechanism for material transfer with the help of neat sketch. [7]
- 3.a) In a 10 station transfer line, the probability that a station break down will occur for a given work part is equal to 0.02. This probability is the same for all 10 stations. Determine the frequency of line stops per cycle on this flow line using the lower bound approach and also calculate the production rate. [7]
b) Discuss briefly about the Buffer stock effectiveness used in automated flow line. [4]
c) Discuss the efficiency of automated flow lines without storage buffer. [4]
- 4.a) Explain the steps used in solving the line balancing problem by using Largest-Candidate Rule method. [6]
b) Explain how the parallel stations will improve the line balance. [4]
c) Define cycle time in the line balancing and explain briefly. [5]
- 5.a) Explain the paint strips technology used in Automated Vehicle Systems for vehicle guidance. [5]
b) Explain the advantages of implementing various principles of material handling. [5]
c) Describe the Driverless Automated Guided Train System. [5]
- 6.a) Briefly describe the Storage structure of an AS/RS. [5]
b) Discuss the different applications of AS/RS technology. [5]
c) Describe the Fully/Empty bin detectors of an AS/RS. [5]

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- 7.a) List out the differences between ACO and ACC types of adaptive control. [4]
b) Explain the variables in the Adaptive Control with Optimization system for drilling process. [6]
c) Draw the block diagram of a typical computerized Adaptive Control with Constraints system for milling process. [5]
- 8.a) List out the various components of CMM. [4]
b) What are the advantages of non-contact inspection techniques? [5]
c) What are the basic functions of machine vision system? [6]